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Connectivity in hypergraphs

The connectivity of a connected, nontrivial graph G, $\kappa(G)$, is the least number of vertices whose deletion from G results in a graph that is not connected. Deleting a vertex v means removing v from $V(G)$ and either removing v from each edge that contains it, or removing from $E(G)$ each edge that contains v. For graphs there is no practical difference between the two approaches, but for hypergraphs these two options can yield very different results. In this talk we'll explore these two definitions of hypergraph connectivity, known as weak and strong vertex deletion, respectively. We'll use a good number of examples to illustrate the concepts. Along the way we'll prove that the strong vertex connectivity (κ_s) of a hypergraph is always less than or equal to the weak vertex connectivity (κ_w) and we'll discuss the tractability of determining κ_w and κ_s. Finally, we'll extend a theorem of Whitney from graphs to hypergraphs – introducing the concepts of weak and strong edge deletion – furthering our understanding of the relationship between these various notions of hypergraph connectivity.